Shape of Life
The Story of the Animal Kingdom

Spectacular Simple Sponges

Ancient Trailblazing Animals

Overview

Students explore unique sponge adaptations through short Shape of Life videos and student-centered activities in the 5E Instructional Model. Options to engage students include showing a short clip of a sponge phenomenon with the audio muted. Then students identify sponge adaptations with the support of one or more video segments and the Sponges Fact Sheet. Students will record notes about physical and behavioral adaptations, then create a model of a sponge, labeling its structures and adding annotations to describe their functions. Possible Enrich / Extend activities are listed at the end of the lesson, with options to engage all learners.

Subjects
Science, Environmental Education, Writing, and Art

Grades 6–12

Time
45–90 minutes

Vocabulary
Adaptations, collagen, evolution, freshwater ecosystems, marine, natural selection, Porifera, spicules

Objectives

- Students will explore phenomena related to sponges and theorize about what they observe.
- Students will describe sponge adaptations and sponges' important roles in ecosystems orally and in writing.
- Students will create labeled models of sponges.

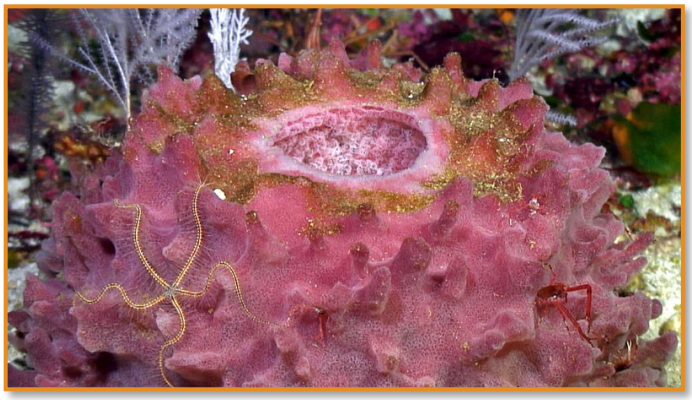
A yellow glass sponge in the deep sea provides habitat for hundreds of brittle stars.
Image: NOAA

Standards		Middle School / High School
Next Generation Science Standards	Performance Expectations	MS-LS1-2. Develop and use a model to describe the function of a cell as a whole and ways the parts of cells contribute to the function. MS-LS1-3. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. [Clarification Statement: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. MS-LS1-4: Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. MS-LS3-2: Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. MS-LS4-2: Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. HS-LS4-1: Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
	Disciplinary Core Ideas	LS1: From Molecules to Organisms: Structures and Processes LS1.A: Structure and Function LS1.B: Growth and Development of Organisms LS4: Biological Evolution: Unity and Diversity LS4.C: Adaptation
	Crosscutting Concepts	• Cause and Effect • Structure and Function • Systems and System Models
	Science & Engineering Practices	• Developing and Using Models • Engaging in Argument from Evidence • Obtaining, Evaluating, and Communicating Information

Common Core ELA		
	Writing	7
	Speaking & Listening	4, 6
	Language Standards	1, 2, 3, 6

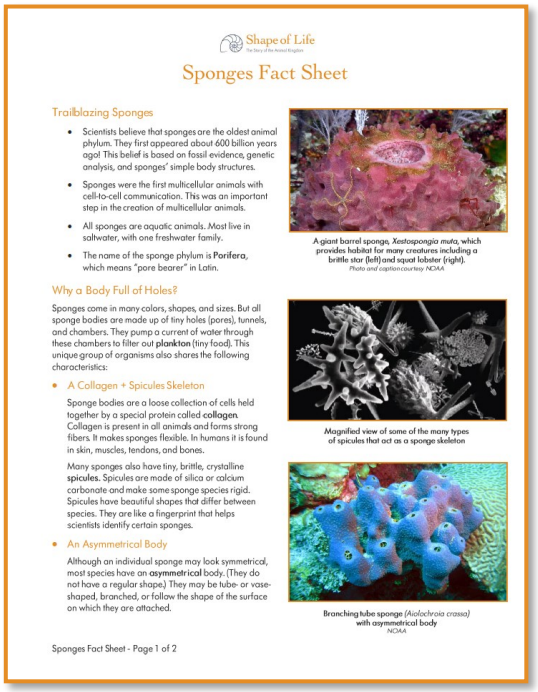
Teacher Background

See the Sponges Fact Sheet for details about their key characteristics, life cycle, reproduction and important ecological roles: shapeoflife.org/factsheets.



A giant barrel sponge provides habitat for brittle stars, squat lobsters and more
Photo: NOAA

Materials + Preparation



Shape of Life

Sponges Fact Sheet

Trailblazing Sponges

- Scientists believe that sponges are the oldest animal phylum. They first appeared about 600 billion years ago! This belief is based on fossil evidence, genetic analysis, and sponges' simple body structures.
- Sponges were the first multicellular animals with cell-to-cell communication. This was an important step in the creation of multicellular animals.
- All sponges are aquatic animals. Most live in saltwater, with one freshwater family.
- The name of the sponge phylum is **Porifera**, which means "pore bearer" in Latin.

A giant barrel sponge, *Xestospongia muta*, which provides habitat for many creatures including a brittle star (left) and squat lobster (right).
Photo and caption courtesy NOAA

Why a Body Full of Holes?

Sponges come in many colors, shapes, and sizes. But all sponge bodies are made up of tiny holes (pores), tunnels, and chambers. They pump a current of water through these chambers to filter out **plankton** (tiny food). This unique group of organisms also shares the following characteristics:

- A Collagen + Spicules Skeleton

Sponge bodies are a loose collection of cells held together by a special protein called **collagen**. Collagen is present in all animals and forms strong fibers. It makes sponges flexible. In humans it is found in skin, muscles, tendons, and bones.

Many sponges also have tiny, brittle, crystalline **spicules**. Spicules are made of silica or calcium carbonate and make some sponge species rigid. Spicules have beautiful shapes that differ between species. They are like a fingerprint that helps scientists identify certain sponges.

Magnified view of some of the many types of spicules that act as a sponge skeleton

- An Asymmetrical Body

Although an individual sponge may look symmetrical, most species have an **asymmetrical** body. (They do not have a regular shape.) They may be tube- or vase-shaped, branched, or follow the shape of the surface on which they are attached.

Branching tube sponge (*Aiolochroia crassa*) with asymmetrical body
NOAA

Sponges Fact Sheet - Page 1 of 2

- Make copies of the "Sponges Fact Sheet," one for each student or pair of students, and/or share it with them electronically: shapeoflife.org/factsheets
- If you have access to a projector, prepare to show one or more beautiful images of sponges, such as the one at the top of the Sponges page from Shape of Life: shapeoflife.org/resource/about-sponges.
- Shape of Life video "Sponges: Origins" (14:02): shapeoflife.org/video/sponges-origins

  Decide if you will show the video to the whole class and/or have partners view the video and take notes about sponge adaptations.
- Other short videos you may incorporate into the lesson to illustrate key concepts in the Explain section, or as part of Enrich / Extend activities are available at shapeoflife.org/resource/about-sponges:
  - "Sponges: Filter Feeding Made Visible": shapeoflife.org/video/sponges-filter-feeding-made-visible
  - "Sponges: Time-lapse of Sponge Cells Recombining": shapeoflife.org/video/sponges-time-lapse-sponge-cells-recombining
  - "Sponge Animation: Spicules": shapeoflife.org/video/sponge-animation-spicules
  - "Sponge Animation: Wild Ride Through a Sponge": shapeoflife.org/video/sponge-animation-wild-ride-through-sponge
- Prepare to share photos of sponges and/or physical specimens with the class. NOAA's Ocean Exploration image gallery is a good source: oceanexplorer.noaa.gov/image-gallery. (Click the Invertebrates link, then the Sponges link.)
  - If you are providing physical specimens that are man-made sponges, try to make them as realistic as possible by cutting them into more natural sponge shapes, and adding some larger holes.
- Computer with Internet connection and data projector if you plan to show all or part of the video(s) to the whole class
- Science notebook and pencil or pen for each student
- Whiteboard or chart paper and markers
- *Optional:* Colored pencils and/or markers for students to share, foam, colored paper, scissors, tape, or other materials to use for sponge models
- *Optional:* Review the "Origins: Animal Eve" chapter from Shape of Life and/or make copies for students: shapeoflife.org/sites/default/files/global/Origins-Animal-Eve.pdf.

Teaching Suggestions in the 5E Model

Engage

1. Options to "hook" students and introduce the lesson. (2–5 min.)

- If you have access to a projector, show students one or more photos of beautiful sponges, such as those on page 8 of the "Origins: Animal Eve" chapter: shapeoflife.org/sites/default/files/global/Origins-Animal-Eve.pdf. The image at the top of the sponge webpage is another option: shapeoflife.org/resource/about-sponges.
- With or without visuals, ask students to, "Imagine you are a simple animal that is stuck to a surface underwater. It could be on the ocean floor, a rock, or in a body of freshwater, like a lake or stream. Food particles are floating around you, but you have no mouth, arms, legs, or stomach. You're hungry! How would you get food? What structures might you need to help you feed?"
- Give the students a minute to brainstorm ideas with a partner, then ask the groups to share their ideas with the whole class and discuss.
- Show students the short video "Sponges: Filter Feeding Made Visible" (2:17) with the sound muted and the title of the video hidden: shapeoflife.org/video/sponges-filter-feeding-made-visible.

Screenshot from "Sponges: Filter Feeding Made Visible" from Shape of Life

- Ask students to discuss the phenomenon with their partner and share ideas about these questions:
  - What is the scientist trying to do?
  - Why is dye coming out of the large holes?
  - Why is the sponge performing this action?
  - If this action has to do with feeding, how would you say the organism is getting food?
- Ask students to share their ideas with the class. Tell them that today they will be learning about sponges—spectacular simple animals that were among the very first to evolve on Earth.
- Ask students to complete the "Spectacular Sponges Trivia" activity at the end of the lesson to see what they already know about the phylum and prime them for the lesson. You could also ask them to try to answer trivia questions orally (with or without a partner).

Explore

2. Students examine real sponges. (2–3 min.)

- Pass around actual or cellulose sponge (if available), from which students can record observations.
- Ask students, "What does this have to do with sponge animals?" Give them a moment to think and share their ideas with a partner. Tell them they will have more time to think about the question as they explore the fascinating, ecologically important, and widespread group of animals called sponges.

3. Ask students to watch "Sponges: Origins" and consider sponge adaptations. (20–25 min.)

- Depending on how many computers and/or other devices your students have access to, consider asking them to watch the video with a partner while thinking about the **adaptations** that help sponges survive. They should record notes about physical adaptations (body structures) and behavioral adaptations (things the organisms do) that help them to survive. Consider giving them a choice between recording notes in science notebooks and a digital format.
    - What is unique about sponge cells? How are they different from other animals' cells?
    - How is a sponge's body held together?
    - What structures help sponges feed?
    - What can a sponge do if its body is injured?
    - What allows sponges to pump water?
    - How do sponges reproduce?
- Encourage students to turn on closed captioning using the CC button so they can read along with the video. Students can also use headphones, if available, to better hear the narration and minimize distractions from other groups.
- Circulate through the class, answering questions and providing feedback, as necessary.
- If you have shared a real sponge if available, or cellulose, ask students what they think it is. After they share their ideas, clarify that it is the collagen remains of a sponge (or a man-made sponge made of cellulose/plastic).
    - Ask students, "Why are sponges used to absorb liquids?" Discuss real versus man-made sponges. (Man-made sponges are typically made of cellulose (wood fiber) or plastic. Both types of sponges' materials attract and absorb water, as does collagen in natural sponges. All have a network of holes and channels that prevent water from draining away. Man-made sponges are engineered for an ideal number of holes and channels to absorb water efficiently.)
- Pass out copies of the "Sponges Fact Sheet," one for each student or pair. Ask students to use it to add to their notes and be ready to share their ideas about sponge adaptions with the class.

4. Invite students to create a model of a sponge. (5–15 min.)

- This could be a detailed scientific illustration on paper or a 3D model, using upcycled foam, paper, and/or other materials.
- Ask students to label important structures. They might also add arrows or other symbols to indicate movements and other processes.

Explain

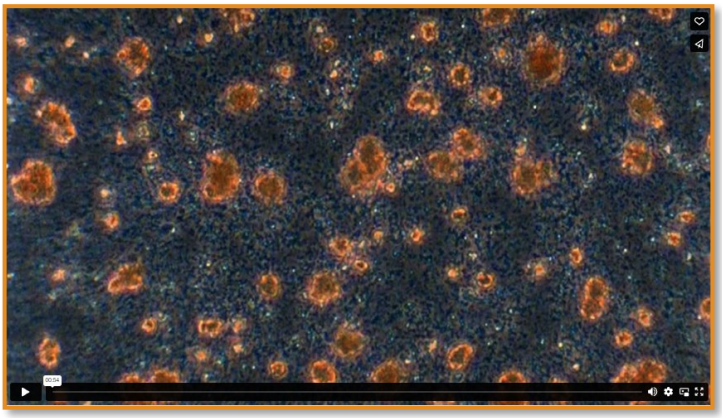
5. Discuss important concepts and terms with students. (4–15 min.)

- Gather students together and ask them to share their sponge models. Briefly discuss their ideas about sponge adaptations and how they are shown on their models. Use the following questions (the same as above) as starting points:
  - What is unique about sponge cells? How are they different from other animals' cells?
  - How is a sponge's body held together?
  - What structures help sponges feed?
  - What can a sponge do if its body is injured?
  - What allows sponges to pump water?
  - How do sponges reproduce?
- Discuss important concepts explained on the Sponges Fact Sheet, writing them on the board, using the presentation for visuals, and/or asking students to help you record them. Ask students to add to their notes in notebooks or electronically.

6. Discuss other key concepts with the support of the "Sponges: Origins" video and fact sheet, such as:

- How sponges may have been the first multicellular animals and the first with cell-to-cell communication. This was an important step in the creation of multicellular animals.

  You might first show "Sponges: Time Lapse of Sponge Cells Recombining" with the sound muted and ask students to think about what is happening before explaining the incredible phenomenon: shapeoflife.org/video/sponges-time-lapse-sponge-cells-recombining.



Screenshot from "Sponges: Time Lapse of Sponge Cells Recombining" from Shape of Life

- All sponges are aquatic animals. Most live in saltwater, with one freshwater family.
- The name of the sponge phylum is **Porifera**, which means "pore bearer" in Latin.
- ### A Collagen + Spicules Skeleton

  Sponge bodies are a loose collection of cells held together by a special protein called **collagen**. Collagen is present in all animals and forms strong fibers. It makes sponges flexible. In humans it is found in skin, muscles, tendons, and bones.

  Many sponges also have tiny, brittle, crystalline **spicules.** Spicules are made of silica or calcium carbonate and make some sponge species rigid. Spicules have beautiful shapes that differ between species. They are like a fingerprint that helps scientists identify certain sponges.

  The short video "Sponge Animation: Spicules" (1:59) helps explain the concept: shapeoflife.org/video/sponge-animation-spicules.

- ## Reproduction

  Sponges were the first animals to reproduce sexually. But they can also reproduce asexually. During asexual reproduction, a piece may come off of an individual sponge. The piece can re-attach itself to a suitable surface and then rebuild its form.

  Most sponges are **hermaphrodites**. That means they can function as both male and female. During sexual reproduction, sperm is released into the water. It is then sucked into an individual of the same species and delivered to the eggs where fertilization takes place inside the sponge's body.

- ## Life Cycle

  Sponges begin life as a free-swimming larva, hatched from a fertilized egg. The larva is released into the water from a parent sponge. After drifting for a few days, the larva sinks and crawls until it finds a place to settle. It then grows into an adult form. All adult sponges are **sessile**, meaning that they attach to an underwater surface and stay fixed in place.

- Ask students:
  - Why do sponges have holes?" Discuss their ideas and how their body structure helps them to survive.
  - What are ways sponges could be important to other organisms in the ocean?
  - What are other examples of pumps (in animals or everyday life)?
    - Examples: heart pumping blood, electric air pump for an aquarium, mechanical pump used to fill bicycle tires
  - Are there any animals on land that are "filter feeders?"
  - You might show "Sponges: Filter Feeding Made Visible" (2:17) with the sound playing to help explain the concepts: shapeoflife.org/video/sponges-filter-feeding-made-visible.
- Examine photos of sponges from NOAA's Ocean Exploration image gallery: oceanexplorer.noaa.gov/image-gallery. (Click the Invertebrates link, then the Sponges link.)
  Ask students to discuss:
  - What evidence is there that other organisms use sponges? How do they use them?
    Describe what you see.
  - How are different types of sponges similar (what do they all have in common)? How are they different?
  - What does a sponge's pump do, in addition to helping it feed?
  - Ask students to support their ideas with other reputable sources on the internet.
- Ask students how sponges might be important to their ecosystems and life on Earth. Discuss how:
  - Sponges live in a wide range of ocean habitats, from the polar regions to the tropics. They are also found in freshwater habitats, such as rivers. They are found from shallow water to the deep ocean.
  - Sponges function as **foundation species** in some areas. This means they support many other organisms in an ecosystem.
  - They provide shelter for other species, such as shrimp and crabs, as solitary sponges or in sponge reefs.

- They are a food source for sea stars, many fishes, particularly parrotfishes, and sea turtles.

7. Ask students to add more details, labels and annotations to their sponge models. (10 min.)
    - Ask students to add final details to their scientific sketches, 3-D models, and/or computer-generated diagrams of sponges. Encourage students to label the individual structures and add written annotations that explain their functions and how the adaptations help the sponges to survive.
    - Models can be completed with the support of reference materials such as books and reputable sources on the Internet. Students can also add color to their diagrams.
    - Ask students to share one or more of the models they have created. The models should show both external and internal structures.

Evaluate

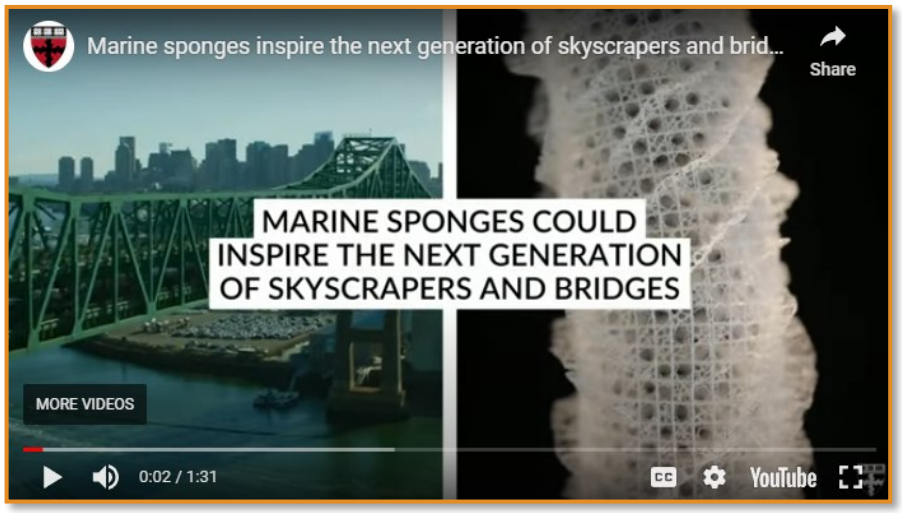
6. Students present their models and/or other projects to the class.
    - Provide a rubric such as the one at the end of the lesson so students know how they will be assessed.
    - Completed projects can be displayed on classroom and/or school walls.
7. Review completed student models and science notebooks.
    - Review student models/diagrams, labels, and annotations.
    - Check that they have explained sponge structural and behavioral adaptations, including ways they are able to catch food and reproduce.
8. Closing discussion / reflection (5 – 15 min.)
    - Ask students to reflect on what they learned in the lesson, including about sponge adaptations, orally and/or in writing. Ask them to reflect on what you, as the teacher, might do to improve the lesson next time.
    - Ask students to use arguments based on empirical evidence and scientific reasoning to support an explanation for how sponge behaviors and structures affect the probability of successful reproduction. (Adapted from MS-LS1-4)
    - Ask students to construct an explanation that predicts patterns of interactions among sponges and other organisms in both marine and freshwater ecosystems. (Adapted from MS-LS2-2)
    - Ask how sponge adaptations, such as a multicellular body, a body made of collagen, cell-to-cell communication, spicules, and sexual reproduction relate to the evolution of animals. Discuss student ideas and how similar structures and behaviors are found in all animal groups. For example, **spicules** made of silica or calcium carbonate that make some sponges rigid are similar to skeletons in vertebrate animals, such as mammals.

Extend / Enrich

- Ask students to research which animals scientists believe were the first animals to evolve. Some scientists believe they were sponges, and some believe they were comb jellies.
    - Students can include brief descriptions of those organisms, including the features and adaptations that define the organism as an animal.
    - They can describe scientists' arguments (evidence) that support that animal being the first to evolve.

- Students can decide what they believe and support their decision in writing, based on the evidence they have discovered.
- Ask students to use reliable sources of information for this project (e.g. Shape of Life resources, natural history museum websites).
- Help guide high school students to "Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence." (NGSS). Discuss how the evidence for sponge evolution—and similar traits found in more complex animals, such as cell-to-cell communication, sexual reproduction and rigid structures made of calcium carbonate (spicules in sponges and skeletons made of bones in mammals, for instance) are some of the many points that support the overall theory of evolution.

- Ask students to use biomimicry to help them design a useful new product inspired by sponges. (30 min. or more)
  - You might show the short video "Marine sponges inspire the next generation of skyscrapers and bridges" (1:30) with more details on the Ask Nature website for inspiration: asknature.org/innovation/building-materials-inspired-by-marine-sponges.



  - Discuss the concept of biomimicry: using nature to inspire human innovation.
  - Consider stepping students through the engineering design process with resources such as those on the Teach Engineering site: teachengineering.org/populartopics/designprocess.

- Conduct a field study into sponges found in your area. This could include freshwater ecosystems, as well as the ocean. (Will vary)
  - Visit the animals in their natural ecosystems, if possible, such as tidepools, coral reefs, or clean rivers.
  - Students can record observations of them and organisms using them as habitat in field notebooks. Questions can be written down and researched later.
  - You might contact local wildlife agencies for the best places to find them. Agency staff may also be able to tell you if local sponges or species that depend on them are threatened and should therefore be left undisturbed.

- Observe sponges under magnification. (1 – 20 min.)
  - If you have access to live or preserved sponges, students can view them and/or their body structures under magnification via a microscope, hand lens, and/or macro lens to better see their unique adaptations.

- You can also use a microscope or macro lens connected to a computer and/or data projector to show them to the whole class.

- Dissect paper models of sponges—or real sponges. (20 min.)
  - These 3D paper models could be used for dissection, or students could be encouraged to create their own models that could be dissected: gettingnerdywithmelandgerdy.com/store/Sponge-Scienstructable-3D-Dissection-Paper-Model-p157998001.
  - If you have access to live or preserved sponges, you could lead students in an actual sponge dissection with the support of videos such as this one from Fran Sandmeier (0:56): youtube.com/watch?v=OepWxdrLzxk.

- Ask students to discuss articles about sponges with career connections, such as:
  - "Amanda Kahn, Assistant Professor…" Shape of Life: shapeoflife.org/news/featured-scientist/2021/10/11/amanda-kahn-assistant-professor-moss-landing-marine-laboratories
  - "This Sponge Fossil May Be the Earliest Record of Animal Life": *Smithsonian*: smithsonianmag.com/science-nature/sponge-fossil-may-be-earliest-record-animal-life-180978297
    - Ask students to read about and discuss the most ancient animal fossils yet discovered. You can make copies of the article or direct students to it online.
    - Ask students to discuss the importance of the 890-million-year-old fossils and what they might teach about the story of the animal kingdom.

Filter feeder specialist Amanda Kahn, Ph.D.

- Students can compare a sponge to another organism. (10–20 min.)
  - Ask students to compare a sponge with another organism—either a modern one or an ancient species. For example, a Venn diagram or another type of graphic organizer could be used. Then students could explain their graphic organizers in writing.
  - Oral presentations can be given to the class which explain the analytical comparisons.

- Students can write fictional stories or poems that incorporate living sponges. (15 min. or more)

  Stories can include one or more species that depend on sponges for habitat, such as arthropods. For example, students might write an imaginative piece about a day in the life of a squat lobster and how it gets everything it needs to live from sponges and food sources found on them. Or the piece could be set in a tidepool with sponges, crabs, and other organisms attempting to cope with a warming ocean and ocean acidification.

- Set up learning/exploration centers and offer students a choice of activities.

  Set up classroom centers with other activities related to sponges and their adaptations, such as those listed above. This would provide more opportunity for student choice and differentiated learning experiences to maximize intrinsic motivation, engagement, and learning.

Expand Knowledge + Skills

Sponge Background / Readings

- "Sponges." Shape of Life:
  - shapeoflife.org/resource/about-sponges
  - shapeoflife.org/sites/default/files/global/sponges-the-simplest-animal.pdf
- "Origins: Animal Eve." Shape of Life: shapeoflife.org/sites/default/files/global/Origins-Animal-Eve.pdf
- "Phylum Porifera." Exploring Our Fluid Earth: Teaching Science as Inquiry (TSI). Univ. of Hawai'i: manoa.hawaii.edu/exploringourfluidearth/biological/invertebrates/phylum-porifera
- "Sponges Help Coral Reefs Thrive in Ocean Deserts." BBC: bbc.co.uk/news/science-environment-24398394
- "The UN-Fragile Glass Sponge." Shape of Life: shapeoflife.org/news/featured-creature/2021/09/29/un-fragile-glass-sponge

Related Lesson Plans / Activities

- "World's Most Awesome Invertebrate." Shape of Life: shapeoflife.org/sites/default/files/SoL-Lesson-Awesome-Invertebrate_0.pdf
- Activities from Exploring Our Fluid Earth: Teaching Science as Inquiry (TSI). University of Hawai'i:
  - "Further Investigation: Phylum Porifera." manoa.hawaii.edu/exploringourfluidearth/biological/invertebrates/phylum-porifera/further-investigation-phylum-porifera
  - "Question Set: Evidence of Common Ancestry and Diversity." Exploring Our Fluid Earth: Teaching Science as Inquiry (TSI). University of Hawai'i: manoa.hawaii.edu/exploringourfluidearth/biological/invertebrates/evidence-common-ancestry-and-diversity/question-set-evidence-common-ancestry-and-diversity
  - "Question Set: Phylum Porifera." Exploring Our Fluid Earth: Teaching Science as Inquiry (TSI). University of Hawai'i: manoa.hawaii.edu/exploringourfluidearth/bioSlogical/invertebrates/phylum-porifera/question-set-phylum-porifera

Related Videos

- Explore the other Shape of Life sponge videos: shapeoflife.org/resource/about-sponges
- "How This Florida Town Became The Sea Sponge Capital Of The World." Business Insider: youtu.be/9QvE6hlLowA

Standards

- Next Generation Science Standards, including a link to the *Framework for K-12 Science Education* to which this lesson was aligned: nextgenscience.org/framework-k%E2%80%9312-science-education
- Examples of what NGSS looks like for California students can be found in the 2016 Science Framework for California Public Schools: cde.ca.gov/ci/sc/cf/documents/scifwchapter4.pdf
- Common Core State Standards and links to the complete documents: corestandards.org

Shape of Life

The Story of the Animal Kingdom

Appreciation + Thanks

Thank you for using Shape of Life resources and helping to inspire the next generation of thinkers and scientists! We also greatly appreciate all of the scientists who have been collaborating with us to produce the videos and supporting resources. We welcome your questions or comments.

Lesson plan and supporting resources written, designed, and produced by
Rick Reynolds, M.S.Ed. and Krista Reynolds, MLIS, M.Ed.
Engaging Every Student
rick@engagingeverystudent.com

Edited by Nancy Burnett and Natasha Fraley
Shape of Life

Name: _____ Period: _____ Date: _____

Shape of Life
The Story of the Animal Kingdom

Spectacular Sponges Trivia

Put an "X" or checkmark in front of all that apply.

1. Sponges are classified as:

   ___ Plants ___ Fungi

   ___ Animals ___ Protists

2. Sponges have complex organs.

   ___ True ___ False

3. Sponges are only found in marine (ocean) ecosystems.

   ___ True ___ False

4. Most sponges contain **spicules** made of calcium carbonate or silica.

   ___ True

   ___ False

5. Sponges are **sessile**, meaning they are stuck in place, during all life stages.

   ___ True

   ___ False

6. Sponges are **hermaphrodites**, organisms with both female and male reproductive systems.

   ___ True

   ___ False

7. Sponges can reassemble themselves if they are broken apart.

   ___ True

   ___ False

8. What roles can sponges play in their ecosystems (places they live)?

   _____

   _____

   _____

Name: _____ Period: _____ Date: _____

Shape of Life
The Story of the Animal Kingdom

Spectacular Sponges Trivia KEY

Put an "X" or checkmark in front of all that apply.

1. Sponges are classified as:

   ___ Plants ___ Fungi

   _X_ Animals ___ Protists

2. Sponges have complex organs.

   ___ True _X_ False

3. Sponges are only found in marine (ocean) ecosystems.

   ___ True _X_ False

4. Most sponges contain **spicules** made of calcium carbonate or silica.

   _X_ True

   ___ False

5. Sponges are **sessile**, meaning they are stuck in place, during all life stages.

   ___ True

   _X_ False

6. Sponges are **hermaphrodites**, organisms with both female and male reproductive systems.

   _X_ True

   ___ False

7. Sponges can reassemble themselves if they are broken apart.

   _X_ True

   ___ False

8. What roles can sponges play in their ecosystems (places they live)?

   Sponges provide habitat, including shelter and food, for other animals. Sponges improve water quality in coral reefs and other marine and freshwater ecosystems by filtering water, collecting bacteria, and processing carbon, nitrogen, and phosphorus.

Shape of Life
The Story of the Animal Kingdom

Sponge Glossary

adaptation	process in which an organism changes over many generations to better fit its habitat
asexual reproduction	process by which new offspring are produced by a single parent; sponges sometimes reproduce asexually by **budding** off pieces of their bodies
bacteria	single-cell organisms that can have positive and negative impacts on ecosystems; critical food for sponges in both marine and freshwater habitats
behavioral adaptation	an action of an organism that helps it survive and reproduce
biomimicry	design and creation of products, materials, and/or systems inspired by biological organisms
budding	process by which a sponge can reproduce asexually
collagen	protein that creates a scaffolding that holds sponge cells together; present in all animals, collagen forms strong fibers and makes sponges flexible.
egg	female reproductive cell; produced by most animals, including sponges
evolution	process by which organisms change over time through **natural selection**
hermaphrodite	organism having both male and female sex organs; sponges are hermaphrodites
larva	free-living, immature stage in the life cycle of many animals (such as sponges and arthropods); often very different in appearance from adult stage and incapable of reproduction
marine	found in or related to the sea
natural selection	process by which organisms better adapted to their environment survive to produce more offspring
Porifera	name of sponge phylum; means "pore bearer" in Latin
sperm	male reproductive cell; produced by most animals, including sponges
spicules	structures made of calcium carbonate or silica found in most sponges; Meshing spicules create structural support and discourage predators.

Name: _____ Period: ____ Date: _____

Model / Presentation Rubric

Title: _____

Presentation Component	Maximum Points Possible	Self-Score (fill out before presentation)	Teacher Score
Part 1: Content			
Subject and purpose of model / presentation clearly introduced	10		
Key concepts identified and clearly explained in well-organized way	10		
All information accurate and obtained from reliable sources	10		
Conclusion summarizes key points in persuasive way; Questions answered thoroughly and accurately	10		
Part 2: Delivery / Audience Engagement			
Speech delivered clearly at appropriate volume and speed (not too fast, slow, loud, or soft)	10		
Speed, volume, and voice inflection are varied to engage audience and emphasize key points	10		
Speaker connects with audience through eye contact and does not spend too much time looking at notes or screen	10		
Speaker demonstrates enthusiasm for topic throughout presentation; audience is persuaded by speaker	10		
Part 3: Visuals			
Visuals help to clearly explain concepts	10		
Part 4: Writing Conventions			
Grammatical and spelling conventions followed	10		
TOTALS:	**100**		

Comments: